

Audio Visual Activity In Science Education

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Film

These four loops have been produced for unit 1. They use apparatus and animated expensive or difficult to perform in a laboratory. Diffraction 1, 2, 3, 4 demonstrate various experiments with X-rays.

induced by the action of the wind.

Energy waves fill the atmosphere and are reflected by the action of the wind.

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able in Standard 8 on accompanied by teaching materials or backwards 1, 2, 3. These three loops are designed for use in the normal time di-

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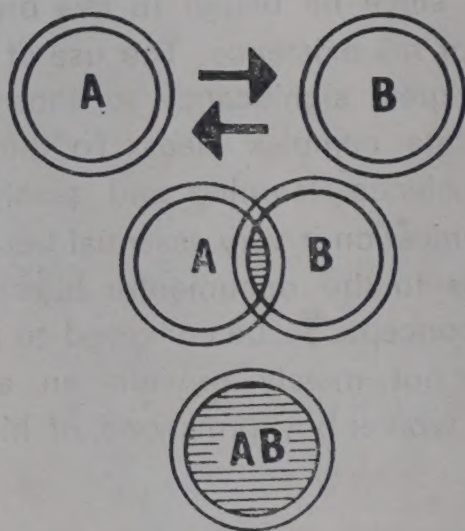
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A NEW TERM AND : OLD CONNOTATION

"COMMUNICATION" seem to be a modern term but its processes and techniques have been developed by man ever since he began to live on this planet. It is a must for his existence. The use of audio-visual methods has great significance to those who have to communicate complex ideas. To those who are involved in science learning and teaching, audio-visual communication is very essential because it clarifies the ideas to the documentor himself and then clarifies the concepts to be conveyed to his counterpart. It does not merely provide an accessory to the scientific worker but forms one of his basic tools of work.

Ancient man moved his lips and created a set of sounds. He created that set again and gave it a meaning. His companion accepted that meaning and recreated the same set of sounds and broadcast the same meaning. This was the beginning of language.

Man used different postures to create a dance and again gave a meaning to his gestures. He started drawing and used it as a tool of communication. Among human beings communication goes on endlessly through spoken words, printed words, printed



**HOW DOES
THE COMMUNICATION
PROCESS
WORK ?**

pictures, projected pictures, sounds through radios, gestures, bill boards and a hundred thousand ways and means. Now let us see how the communication process works:

A is a communicator. He has a set of concepts to be communicated to B.

Now B is at the receiving end of the communication point. But he does not have the same concept which A tries to communicate. Therefore A uses aids like words, pictures, photographs, schematic drawings; and when B receives them the concept starts getting communicated. As the communication grows stronger B's understanding of A's concepts come nearer. When "A" is totally successful in communicating his ideas, B's understanding gets totally synchronised with A's understanding of the concept.

Audio-visual aids help the communicator to quicken this process. They are really multisensorial aids. Now to plan the use of audio-visual aids one needs a rudimentary understanding of their uses and impact. Well-planned audio-visual aids create a multisensorial impact. Therefore the A.V. experience is near to the actual experience. Motion picture is an ideal example of this influence. However consciously we sit in a picture house, a good movie stirs up emotions in us. The illusion of reality works on us and the mind receives the communication almost in its totality,

Audio-visual aids simplify a concept and help the communicator to present a schematic idea. Thus ideas travel smoothly to those who find difficulty in grasping complex concepts.

Audio aids for group work are : Talks, discussions, radio presentation.

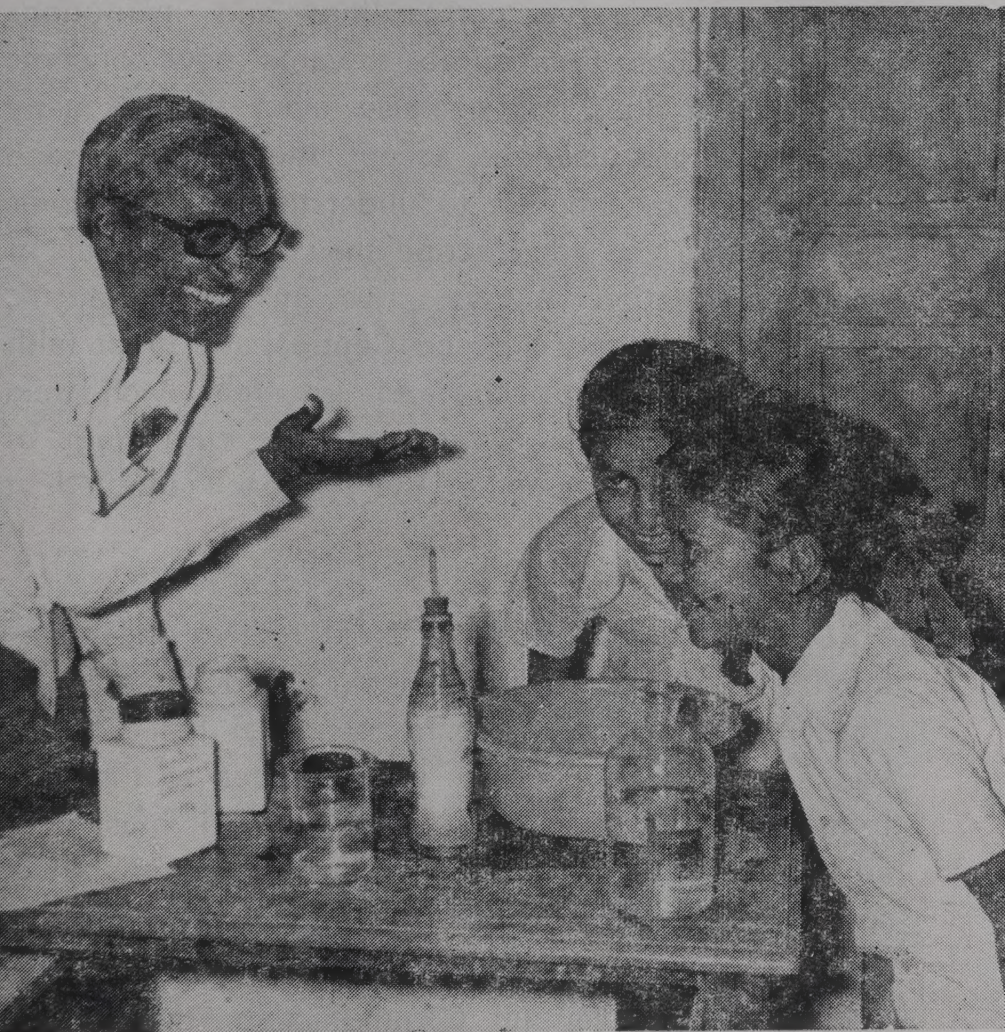
Visual : Flat pictures, photographs, cartoons, graphs, charts, posters, news bulletins, periodicals etc.

Audio-visual : Drama, filmstrip, slide show, (Sound) motion picture, Video recorders, T.V.

These can be described as audio-visual aids and they produce multisensorial experiences.

SCIENCE EDUCATION AND COMMUNICATION

Science in a School now-a-days is nothing more than an organised piece of information which the teacher would pack into his pupils' brain and seal it with a heating rod. A good teacher wants the students to ask questions, devise their own experiments and find out their own results. It does not stop here, the student is always encouraged to make his own documentation and prediction. The student does not however, repeat his experiment the way some scientist did, but he innovates and creates his own set of experiments, his own set of queries and he has his own documentation and prediction. He actually works like any other scientist.



STUDENT
TEACHER'S
SCIENCE
INQUIRY

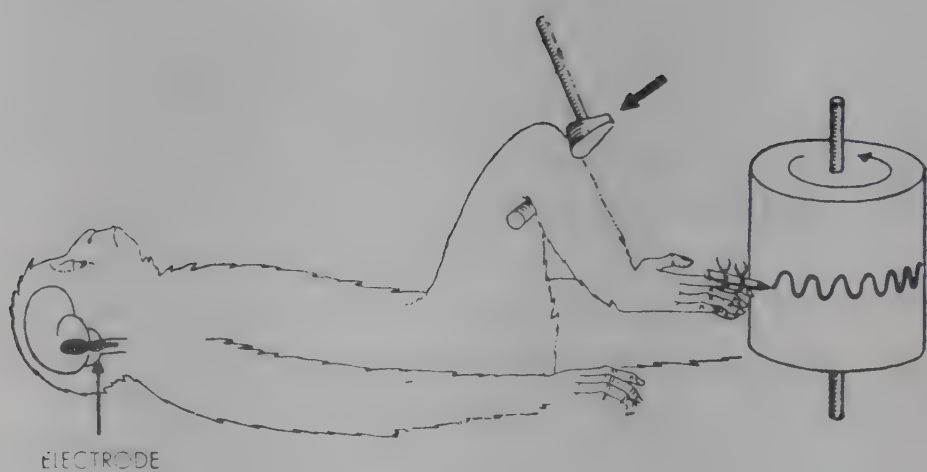
Many of us would wonder whether this approach in science education exists in India. Partly it does, because quite a few personalities and institutions positively devote their efforts towards new concepts and partly it does not because even though many educational organisations accept the new approach outwardly, they are yet to understand its principles and to grasp the great scope they have in terms of science education. Anyway, we at the Vikram A. Sarabhai Community Science Centre have great faith in the modern approach; and we treat each child as a young scientist. Even the new curriculum of our state has an impact of the approach adopted at the Centre.

"Documentation" plays a great role in the development of scientific thinking. "Documentation" does not mean only a bare record of facts, but it has first to convey a very clearcut idea to the performer of an experiment, and secondly, it must give an insight into the experiment, its data and the envisaged prediction to other experimenters also.

For making "Scientific Communication" meaningful, a scientist must be provided with all the contemporary techniques of documentation. For making his ideas clearer to his fellow workers, he should acquire enough skills to use professional communication tools like films, filmstrips slides and sound equipment.

It is not necessary to use complex gadgets but the scientist will be really equipped well if he knows the basic methods and materials for graphic expression. All those who are involved in creating new pathways have realised the vital need for communication in a way which is still uncommon among working scientists today. The average scientist still remains as anarchic as ever in his methods of publication and barely conscious of his obligation in communication of science and in maintaining a record. In terms of presentation of certain scientific information in paper form, in a learned periodical as a vehicle of transmission, there are great limitations.

The audio-visual activity will not only enrich the scientific activity of the young scientist, but it would also add a new dimension to his thinking. When we talk about scientific communication, let us see what we mean by communication. Communication itself is a process, a complex series of events operating in several dimensions of space and time, and always involving the attitudes, the knowledge, the communication skills of more than one person and the social and cultural context in which he is located. To consider communication then, it is necessary to focus the mind on more than one event, taking place simultaneously and partly consecutively, of communication. The concept of process is one of the most significant ideas of our time.



SCIENCE DOCUMENTATION
IS AN INTERESTING
ACTIVITY

HOW DOES COMMUNICATION HELP THE SCIENTIFIC WORKER ?

The interaction of the experimenter with the audio-visual material excites his imagination and helps him out in finding unforeseen possibilities in his work. At the presentation stage, his co-workers understand the concepts easily and share the information more vividly.

In terms of presenting scientific facts to the community, the technique of communication works wonders. It is only through well published booklets, well conceived films and convincing exhibits that the community can perceive scientific ideas. Indeed, "communication" has to play a very major role in science education of the school-going children and the community.

FROM NON-MECHANICAL AIDS TO MECHANICAL AIDS ;

A switch from non-mechanical to mechanical audio-visual aids is a new experience for both teachers and learners. Simpler aids provide greater scope for creative improvisation. There are many ways of classifying audio-visual aids. Mainly they are classified into two types, mechanical aids and non-mechanical aids.

Non-mechanical aids denote flat pictures, charts, graphs, hand-drawn slides, hand-drawn overhead projector transparencies and epidiascope opaque slides and models.

Mechanical aids signify film strip projectors, slide projectors, opaque projectors, overhead projectors, 8 mm (Super8) projectors and 16 mm projectors. Tape recorders, gramophones, cameras, films, filmstrips and tapes can also be included in this class. Video recording devices are latest in this group.

Use of Discretion : For getting the maximum out of any audio-visual material or equipment, the user should thoughtfully select the material. For quite some time the user may choose a complex technique and miss a point in documentation and presentation. One should therefore start with the simplest of techniques and then go on to a complex technique.

WHAT TECHNIQUES THE DOCUMENTOR SHOULD KNOW ?

The documentor may be a student or a teacher. The scientific experiment can be basically presented through simplified drawings. The quantitative results can be presented by means of a variety of graphs. They can be done either on large sheets or on small opaque projector slides.

If the performer of the experiment finds a few facts which require presentation in its totality, photographic approach should be preferred. If the necessity arises still-photography should be replaced by motion picture presentation. Thus one will realise that a change from a simple to complex audio-visual technique has its own value.

ART MATERIALS FOR AUDIO-VISUAL WORK

It is always practicable to stock a variety of art materials which help in the production of various audio-visual aids. Listed below are major art materials

Papers and Boards :

1. White ordinary drawing paper
2. Good quality cartridge (drawing) paper
3. Coloured drawing papers (grey, black, brown, red, cream)
4. Poster papers (all colours)
5. Tracing paper
6. Coloured tissue paper (kite paper)
7. Cardboard
8. White mount board
9. Thick handmade paper boards
10. Coloured box board

Transparent Materials :

1. Coloured cellophane papers
2. Clear acetate sheets
3. Ground glass
4. Acrylic sheets-clear
5. Coloured acrylic sheets

Pencils and Markers :

1. Coloured magic markers
2. Felt pens

3. Coloured marking pencils
4. Coloured pencils
5. Drawing pencils

Inks and Colours :

1. Poster colours
2. Crylin colours (acrylic base)
3. Photographic tinting sheets
4. Photographic tinting inks
5. Waterproof coloured inks
6. Crayons

Paints :

1. Acrylic paints—white and different colour
stainers
2. Enamel paints
3. Water soluble colour powders
4. Oil colour tubes

Glues and Tapes

1. Ordinary gum paste
2. Adhesive tapes in different sizes
3. Glued paper tapes in different sizes
4. Coloured tapes
5. Rubber cement
6. Fevicol and Araldite

Miscellaneous :

1. Drawing board
2. T - square
3. Compass

ART MATERIAL SOURCES CAN BE LISTED FOR EACH AREA (AHMEDABAD AREA)

Art Materials

Sources.

All drawing equipment	M/s. Kilburns & Co. Relief Road, Ahmedabad.
Hand-made paper	Kalam Khus, Gandhi Ashram, Ashram Road, Ahmedabad.
Fevicol Glue	Fedco Private Ltd., Gujarat Samachar Building, Khanpur, Ahmedabad. Chaise Products, Roopalee, Lal Darwaja, Ahmedabad.
Araldite	Akbarallys, Three Gates, Ahmedabad. P. Chhotalal Shah & Co., Three Gates, Ahmedabad.
Thin Plastic Sheeting	Mayabhai Tayebjee, Three Gates, Ahmedabad. Laloobhai Peerbhoy Momin, Three Gates, Ahmedabad.
All types of pencils, pens, Waterproof inks, colours,	Kika Mulla Gulamaly, Three Gates, Gandhi Road, Ahmedabad 1.

papers, boards, glues,
tapes Ground glass and
tracing paper.

Chunilal Durlabhram,
Opp. Bala Hanuman,
Ahmedabad 1.

Photographic water

colours. Prakash Photographers,
Opp. Patasha Pole,
Gandhi Road, Ahmedabad 1.

Acetate sheets

Bombay Stationery Mart,
Phirozshah Mehta Road,
Fort, Bombay.

Acrylic sheets

Transpack Industries P. Ltd.,
Atladra, Padra Road, Baroda.

Paints, brushes,

coloured pencils : N.M. Shah & Co., Pankore
Naka, Opp. Jumma Masjid,
Ahmedabad.

Rubber cement.

Mayabhai Tayebjee, Three
Gates, Ahmedabad.

Tapes, magic markers, Kilburn & Co.,

felt pens. Relief Road, Ahmedabad.

WHAT IS SIMPLE GRAPHIC MATERIAL

The term "graphics" has different meanings to different people. To a painter it may mean a lithograph or a linocut; to a printer it may mean design

to print; but the graphic approach to a scientific documentor would mean easy to understand presentation with the help of diagrams. Graphics add a certain dimension to the total communication. It provides clearer and more vivid treatment of the subject. Anyone who has to do science learning or science teaching has to understand the nature and use of charts, diagrams, graphs, process charts, process diagrams and X-ray presentation.

From our experience many of us would agree that people who do advanced research work find it difficult to make their counterparts understand what they do. The industry and business has long before accepted the use of this method, but in scientific work audio-visual presentation has still to be fully exploited. Here is a modest list of techniques which can be used for creating statistical graphs. We all know that a graph is a flat picture created through geometric components. There is no complex statistical result which cannot be simplified through a carefully chosen technique of representation. The graphs are of the following types :

1. *Pie graphs*—Pie graph is very convenient to show divided percentages from the total figure. For example, one can easily show the different metals used in a certain alloy.
2. *Bar graphs*—Many comparative statements can easily be expressed by well arranged vertical bars

in a graphic form. Experimenters have always some facts to be compiled and presented to others. A little work on this technique will go a long way.

3. *Area graphs*—Area graph shows relationship between two or three totals. Although this is an interesting technique, school children may find it complicated.
4. *Pictorial graphs*—Pictorial graphs are extremely useful for presenting scientific facts to children and the lay public. For small exhibits they work wonders. It is wellknown that pictures act as symbols which can be interpreted by different groups of people almost in an identical fashion. These are suitable for summarising certain observations of statistical facts. They are ideal for the younger age group. As graphs are essential to the understanding of statistical results, charts, will be of much use in terms of understanding schemes. Here are a few types of charts.

Flow chart shows a sequence.

Stream chart indicates as to how several events come together for forming larger events.

Experience charts are very useful for recording a scientific fieldtrip.

Process charts can be very useful for understanding and making others understand things like

chemical processes etc.

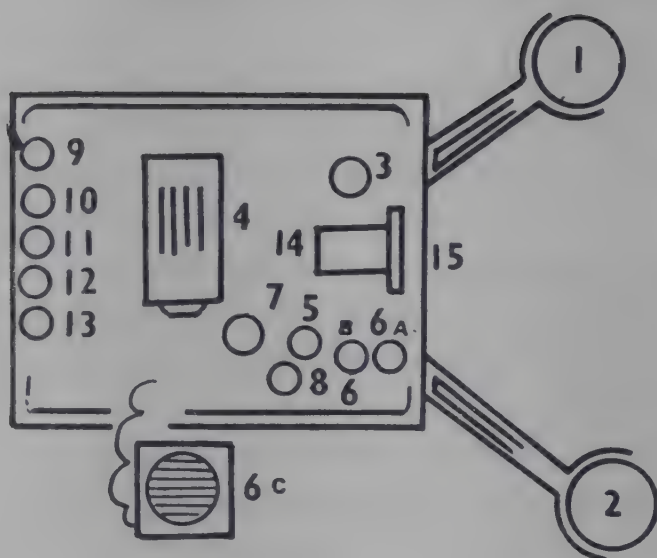
Tree chart is one of the oldest and the simplest especially for presenting problems like petroleum and by-products or any industrial product and its by-products.

APPROACH TO GRAPHIC WORK :

It should be a pleasure for the scientific worker to prepare his own simple graphics. He should never aim at producing professional looking material, but he should achieve simple skills like cutting, pasting, geometric drawing and colouring. The use of material will lead to an understanding of the method and through simple material fruitful results could be obtained. Several attempts based on the trial and error method are required before an acceptable standard is achieved in creating simple graphics. The purpose of his graphic is to analyse the phenomenon by himself and then to explain the facts to others.

PROJECTOR AND PROJECTIBLES

Projectors and projectibles like films, filmstrips and slides give wonderful results. But it is very important to choose the right materials. It is also essential to expose the learner to the material at the opportune moment. The schematic drawing here illustrates the principal parts of a majority of the 16 mm projectors. In the list below (which identifies projector parts)



16 MM
PROJECTOR
SCHEMATIC
DRAWING

underlined items will be familiar to operators of record players, taperecorders and filmstrip projectors. Examine the drawing as you check the items below: Every 16 mm sound motion picture projector, no matter what the make or model, has the following essential components :

1. *A feed reel arm*, on which the full reel of film will go.

2. *A take-up reel arm*, on which the empty, or take-up, reel will go.

3. *A sprocket wheel*, which moves the film smoothly into the projector.

4. *A film-channel* between the lens and aperture, where the light shines through the film.

5. *A Stabilizer*, which holds the film tight as it goes past the sound system.

6. *An Optical Sound System*, consisting of :

(a) *An Exciter Lamp*, which casts a beam of light through the sound track on to a photo-electric cell.

(b) *A Sound Drum*, where light is changed into electric impulses.

(c) *A speaker* which changes these electrical impulses into sound.

7. A *sprocket wheel* (it may be either the same as 3 above, or a seconds procket wheel) which moves the film smoothly away from the sound system.

8. A *Snubber*, which keeps the film from rubbing against the projector case and from breaking when the machine is started.

9. A *motor switch* which turns on the motor that pulls the film through the projector.

10. An *amplifier switch* which allows electricity to run through the amplifier.

11. A *lamp switch*, which turns on the projection lamp.

12. A *volume control*.

13. A *tone control*.

14. A *framer*, which permits the adjustment of the film at the aperture so that only the complete picture can be seen on the screen.

15. A *lens* which permits the focus adjustment of the picture on the screen.

Additional features are included in some makes and models of the 16 mm projectors. They include:

1. A *Hand Test Knob* for running the mechanism without turning on the motor used to check rotation and threading and for single-frame projection.

2. *A sound-silent Speed control-*
3. *A stop-film-device* for projecting a single frame of film as a still picture.
4. *A Reverse Switch*, for running the projector backward.
5. *A Third Sprocket Wheel* between the film channel and the stabiliser.
6. *A Film Safety Device* to stop the machine in the event of faulty film travel.

Sound controls in motion picture machines are identical with those of simple record players. The film moves through a motion picture projector in much the same way as in a filmstrip projector.

The following factors make the operation of a motion picture projector more complicated than a simple combination of a record player and a filmstrip projector :

1. The film moves through a sound projector at a relatively high speed (36 feet per minute). The pictures are shown on the screen at the rate of 24 frames per second.
2. The sound is carried on a track at the edge of the film. The film must move smoothly past the sound head—the point where sound is picked up from this track.

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3. Motion pictures vary from 400 to 2,000 feet in length unlike filmstrips, which are about 5 feet long. This produces special problems for storing and handling of film.

ROOM DARKENING:

When the images are projected on the screen, there is no practical substitute, at present, for a well darkened room. Darkening is needed to produce a clear, bright and easy-to-see picture. Materials used to darken a room include draperies, blinds and pull shades. Pointers about darkening include:

No bright light should fall on the screen surface. No bright light either from outside or inside the room should fall on the viewers' eyes.

In some situations, it is desirable to have some light in the room. In such cases, the light may come from behind the screen but should not exceed the brilliance of the screen image. Or it may come from shielded lights that are directed away from the screen surface and from the eyes of the viewers.

Be aware of claims about projection screens that will eliminate the need for room darkening. Some of these screens now work with some degree of effectiveness, but under markedly limited conditions. The best rule; try out such items under actual classroom conditions before buying.

16 MM PROJECTOR AND FILMSTRIP PROJECTOR REPAIRS:

It has been observed that most of the time the expensive audiovisual equipment lies idle. For continuous service each unit has to be properly repaired.

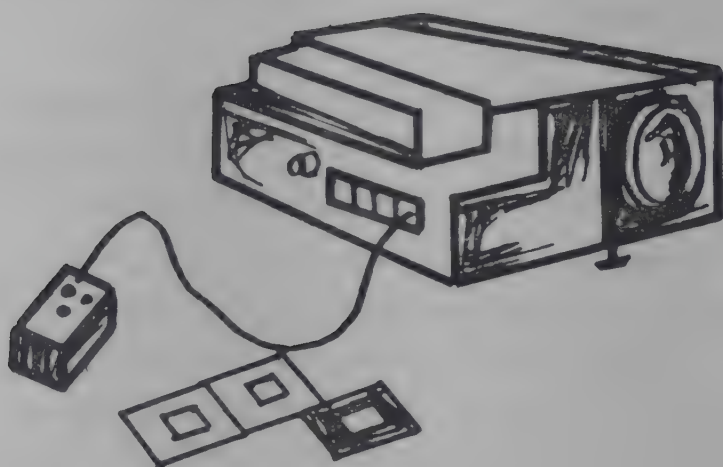
Minor faults can be avoided if you go through the equipment handbooks in detail and follow instructions. A small tool box containing screwdrivers, pliers, a small spanner and a can of light machine oil can also help you. Learn how to use them. The projectors may be defective due to the following reasons:

1. Improper oiling or total lack of oiling
2. Disconnection of electrical wire contacts
3. Faulty cables
4. Loosening of spring belts
5. Faulty threading—improper loop formation.
6. Careless storage.

In the case of major break-downs, never try to tinker with the projector but take them to a reliable repairer.

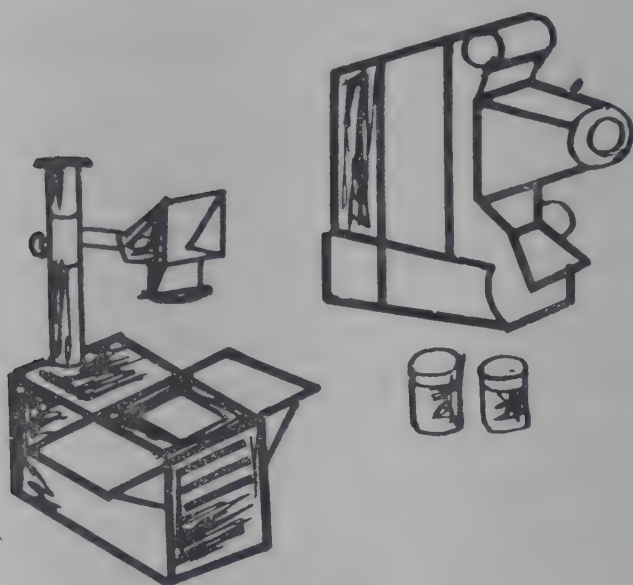
2" X 2" SLIDE PROJECTOR:

The projectors for 2" × 2" slides are properly operated by following the same basic steps as for the standard lantern-slide projectors. Most of the 2" × 2" slides you use will be made photographically. Handmade 2" × 2" slides are not common. The basic elements of the 2" × 2" slide projectors are comparable with the standard lantern-slide projectors.



SLIDE PROJECTOR

OVER HEAD PROJECTOR



FILMSTRIP PROJECTOR

Some hints for operating the 2"X2" Slide Projectors:

1. Place the projector on a stand, connect the power cord, and insert the slide carrier. You are now ready for projection.
2. Turn on the lamp, insert a slide, and adjust the picture - image size to fit the screen by moving the projector towards or away from the screen. Sharpen the screen image by rotating the front lens barrel or by turning the lens-adjustment knob.
3. Project the slides as indicated for standard lantern-slide projectors.

In some machines the slides are placed in the carrier on the right side and removed from the left. Other machines require slide insertion alternately in both the sides. Many types of automatic slide-changer mechanisms are marketed, some of them provide slide containers (cartridges) which can be used for both moving and handling of the slides.

FILMSTRIP PROJECTORS:

Setting up:

1. Set the projector on a stand, connect the power cord and turn on the lamp.

2. Tilt the projector as required. Each machine will have some method of tilt adjustment.
3. Move the projector towards or away from the screen to obtain appropriate image size.
4. Focus the light beam on the screen to sharpen the edges of the white-light area.

Threading and showing:

5. Insert the filmstrip in the carrier. For proper insertion, face the screen, read the filmstrip title, turn the filmstrip (left or right) head down, push the filmstrip gently into the channel until it stops. Continue to push gently and, at the same time, begin to turn the operating knob.
6. When a picture title, or focus frame appears on the screen, focus until the image is sharp.
7. If the image is split between two frames or "out of frame", adjust with the framing control.
8. Framing controls differ in different machines. One type has a lever that is moved up or down to centre or "frame" the image.
9. Rotate the filmstrip advance lever to change the picture on the screen. In most projectors, the filmstrip may be run either forward or backward.
10. Check to be sure that the filmstrip projector is properly threaded, focused and ready to operate.

While putting away:

11. Coil the power cord and store neatly.
12. Retract the front lens and level the machine before replacing the lid.
13. Before closing it, be certain that no filmstrips have been left in the case and that no accessories or spare parts are omitted from the case.

Hints for the operators:

Some machines permit projection of double-frame filmstrips which have a picture area the same as a 2" × 2" slide. Most of the filmstrips used in schools, however, are single-frame filmstrips.

If the projector has a separate switch for the fan and the lamp, always turn on the fan first, then the lamp. In closing a showing, turn off the lamp first, then the fan.

Keep lenses, filmstrip pressure glasses, and film channels clean.

It is not always necessary to fill the entire screen while projecting filmstrips. A smaller, brighter picture may provide better viewing.

A filmstrip will often be accompanied by sound, provided on a tape. Picture changes are indicated

by a tone. You will need extra practice in projecting filmstrips with sound before showing them to an audience; synchronisation of sound and picture must be done accurately.

Hints:

To prevent scratches, keep fingers off the picture surface; handle only by the edges, the blank leader or the blank trailer.

After a filmstrip is used, it will be a loose coil, too large to be put in a can. The correct method is to roll it into a coil so that it can be placed in the container.

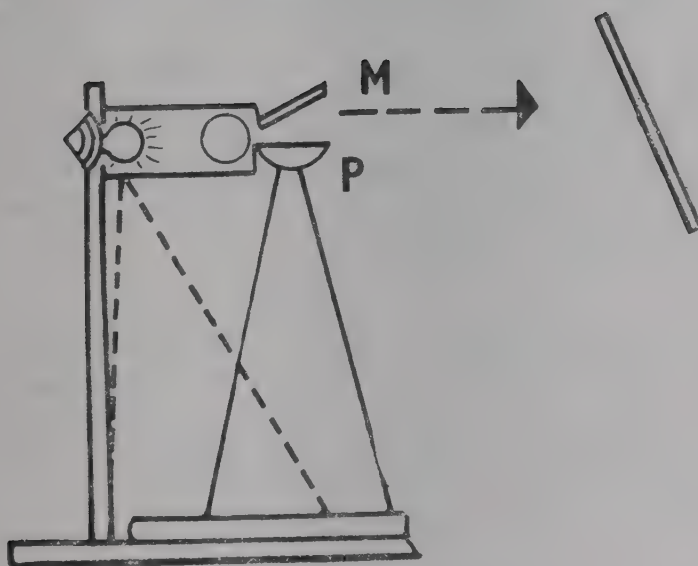
Never tighten an already rolled filmstrip to reduce the size of the coil. This will produce scratches on the film.

Handle filmstrips gently; never force operating mechanisms of filmstrip projectors.

When advancing a filmstrip from picture to picture, make the changes firm and quick.

OVERHEAD PROJECTOR:

Many progressive teachers know about a very versatile tool namely overhead projector. But very few know details about its working. Overhead projectors are available in different designs.



OVER HEAD PROJECTORS
ARE
OF VARIOUS TYPES.
THIS IS A SCHEMATIC
DRAWING OF
AN OVERHEAD PROJECTOR
WHICH WORKS WITH A
FRESNEL LENS.

Given below are the principles of operation of an overhead projector:—

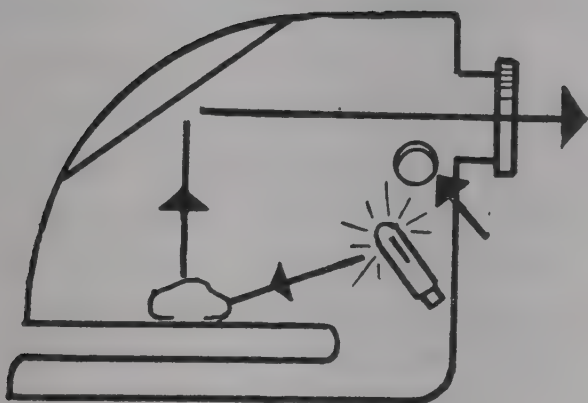
Operation:

The light is projected downward from projection lamp 'L'. The light is reflected off the transparency slate "S" which is located at the base of the projector. The transparency base is actually a mirror and Fresnel lens combination which directs the light upward through the projection lens "PL" to the mirror "M" and then to the projection screen.

Overhead projectors come in several designs.

Interesting possibilities for science education : Overhead transparencies are easy to make. Even students can prepare their own documentation materials out of their science experiences.

- * Materials for preparing the overhead transparencies are available in the local market.
- * Many creative uses can be made for overlaying one transparency on other to develop a concept.
- * By overlaying a mask and removing it gradually the pictograph can be dramatically presented.
- * The teachers and children can develop their own documentation material. This material can be stored and used by others.
- * Art materials for overhead projector work can be developed by willing science teachers.



OPAQUE
PROJECTOR
WORKS WITH
REFLECTED
LIGHT.
IT CAN BE EASILY
UNDERSTOOD BY
CAREFULLY EXAMINING
THE PROJECTOR

- * Several live experiments can be presented e.g. diffusion, neutralization etc.

OPAQUE PROJECTOR:

Opaque projector is a very versatile educational tool. For a science experimenter it works wonders because it does not only enable the experimenter to present tables, graphs, charts, or pictures but it can also conveniently show three dimensional materials like leaves, flowers, rocks, chemicals, small machine parts, cutout models; over and above these, written and typed outlines of new units of study may be projected. Modern opaque projector provides a very useful set of accessories like pointer and placing trays. Here is a schematic presentation of the opaque projector :

SIMPLE COMMUNICATION AIDS

It is always advisable to choose the simplest method of audio-visual communication because it makes the presentation direct. If the aids are easily accessible, the problems of presentation are simpler. It does not mean one should not utilise more mechanical aids; but before choosing mechanical aids, the documentor should see that he has the fullest control of the surroundings i.e. electrical connections, darkening of the room, proper sound system and presentation rehearsal. Here are given a few simple aids. The purpose of this document is

not to provide full details of the aids but to show the great possibilities the simple aids have. The documentor has to use his own creativity to evolve new ways of presentation.

TECHNIQUES OF HAND-DRAWN SLIDES

Without communication, science cannot grow. Modern audio-visual techniques have greatly enhanced the communication process in science. For the science learner the process of translating an idea from one medium into another can greatly clarify his insights. One of the most useful audio-visual tools has been the slide projector. An opportunity for the learner to make his own slides is suggested and described below.

This normally involves the use of photographic slides for black and white or colour transparencies, which are rather expensive as they require cameras, films and processing facilities. However, a simple and inexpensive alternative is provided by the technique of the hand-drawn slides. They involve less investment and running costs and are very easy to prepare. Even a ten-year-old boy can prepare the slides for his own use. The hand-drawn slides open up great possibilities for the student and the teacher. The following materials are necessary for this process:

Water-proof black ink

Crow quill pen (used in engineering drawing)



HAND DRAWN SLIDE
PROCEDURE IS SIMPLE.
MAKE ORIGINAL DRAWING
LESS THAN 2"x2" AREA.
PUT GROUND GLASS
SLIDE OR TRACING PAPER
ON THE DRAWING
TRACE IT WITH PEN,
SKETCHPEN OR DARK PENCIL.

Coloured pencils (glass marking pencils preferably)
Photographic tinting colours
Paper sheets
Ground-glass slides
Plastic mount
Tracing Papers
Gum Tape
Coloured marking pencils
No. 1 brush and various pencils.

The Procedure:

- A. First make your own drawing on a paper. (Remember the size of the original drawing should not be larger than $2'' \times 2''$ because slides and filmstrip projectors mostly take $2'' \times 2''$ standard slides). If you want to use the standard 35 mm or plastic mount for slides your drawing size should be a little larger than $2'' \times 1.1/2''$.
- B. After finishing the drawing, put a $2'' \times 2''$ piece of groundglass (with ground side up) and trace the original, either with lead pencil or waterproof black ink. If you prefer you can draw directly on the ground glass. A little care and practice will make your drawing with ink easy—the recommended pen for this work is a sharp pointed crow quill pen normally used for engineering drawings. In case you like to trace an illustration from a book just place the ground glass on the illustration and trace it.

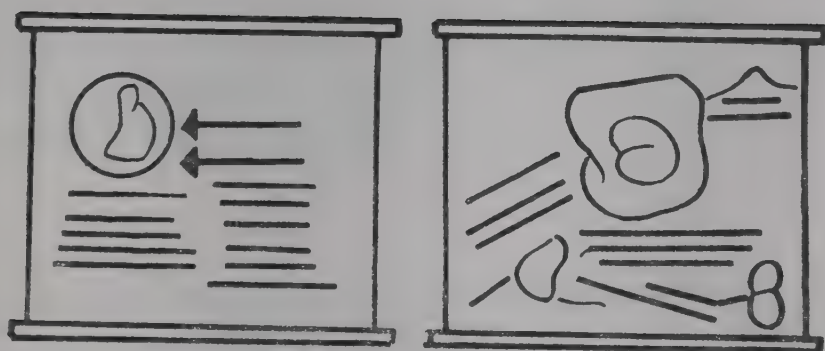
C. After the drawing is ready, if it is to be coloured, coloured pencils—preferably glass marking pencils, magic ink felt pens and transparent gelatine paper (it can be pasted) which is available in different colours can be used. A preliminary trial with various materials will open up immense possibilities. Transparent dyes for colouring the slide can be also used with a No. 1 water colour brush. Small pieces of photographic tinting colour paper sheets can be cut and colour can be diluted according to the desired tint.

Once you start hand-drawn slide making, you won't rest until you build a collection of your own.

CHALK—BOARD

One of the most versatile visual aids is the age old chalk and blackboard. For producing good blackboard work, one needs fairly good practice with the chalk. The basic elements of any blackboard work are circles, squares, vertical, diagonal and horizontal lines. Those who want to produce good chalkboard work, must practise the above elements. Layout, letters, symbols and colour are the four necessary components to produce attractive blackboard work.

Here is a typical illustration of a good layout and a bad layout:



GOOD LAYOUTS
AND POOR LAYOUTS
ARE
A MATTER OF JUDGEMENT.

Layout: A good layout should be less crowded with well-organised letters and illustrations on the blackboard.

Letters: During the presentation, one should not make an attempt to produce print letters but one's lettering should be legible, clear and bold. If the classroom has a depth of 30 feet, two inch letters are good enough. For good lettering standard copy books provide good specimens. There is no short cut to good lettering, except serious copy writing effort. Some basic patterns like these are excellent for practice. This gives more flexibility of chalk manipulation.

Pictorial Symbols:

These symbols make chalkboard work very interesting and meaningful. It is taken for granted that scientific presentation done by a student or a teacher of science needs a certain amount of symbol drawing ability which can be acquired through constant thumb-nail sketching. An easy way to produce certain pictorial symbols is by ready-made template. This can be done by making essential drawings on mediumsized cardboard and cutting them out with a large-size scissors. The symbols for each topic can be stored in a thick brown paper envelope and can be used session after session.

Colours:

Each colour has a symbolic meaning of its own. Blue signifies water, yellow stands for sulphur or sun; green denotes foliage and trees. Before using colours the meaning of colours should be acceptable to the communicator and the receiver. Colour is also used for putting certain stress.

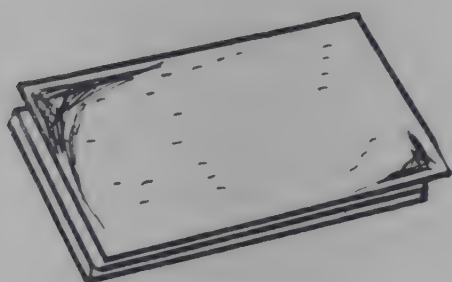
The blackboard has been rightly described as an unending screen where quick animations take place. It has the following advantages:

- It clarifies complex ideas
- specifies the procedure on a definite line
- illustrates essential points in a topic
- presents abstract ideas into a concrete form, and
- motivates discussion

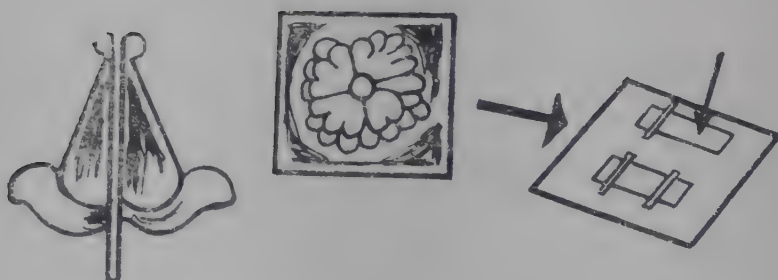
FLANNEL BOARD

In the presentation of any complex concept the simplification of details and schematic design do wonders. For presenting complex concept in a simple fashion, flannel or magnetic board is very useful.

A modest sized flannel board can be 3'X4'. One can conveniently choose a little larger or smaller size, but it is preferable to keep the ratio of 3X4.



FLANNEL CAN BE MOUNTED
ON A BOARD.
SUITABLE KHADI CAN
ALSO BE USED.



DRAWING CUTOUTS
SHOULD HAVE
SANDPAPER BACKING
WHICH WILL
STICK TO FLANNEL.

Material :

1. A piece of soft board, plywood or hardboard.
2. A piece of felt or flannel which should be 4" larger than the board.
3. A roll of adhesive tape or glue like Fevicol.

Steps to proceed :

1. Take the flannel 2" longer than the board on all sides.
2. Tack the cloth at the back of the mounting board.
3. Fold felt neatly at the corners.
4. Bind the left over edges of the flannel with the adhesive tape.

PRODUCTION OF PICTORIAL MATERIAL FOR THE FLANNEL BOARD :

Sandpaper-backed paper materials are ideal. One can also experiment with felt cutouts.

Procedure for sandpaper-backed paper material :

1. Choose the picture; if it is a ready picture cut it out neatly and paste it. If it is to be drawn, draw it on a box-board and colour it boldly. Coloured paper known as "marble paper" can be pasted for marking large colour areas. Poster colours applied with a good quality brush produce neat and flat coloured areas.

1/2 →



3 →



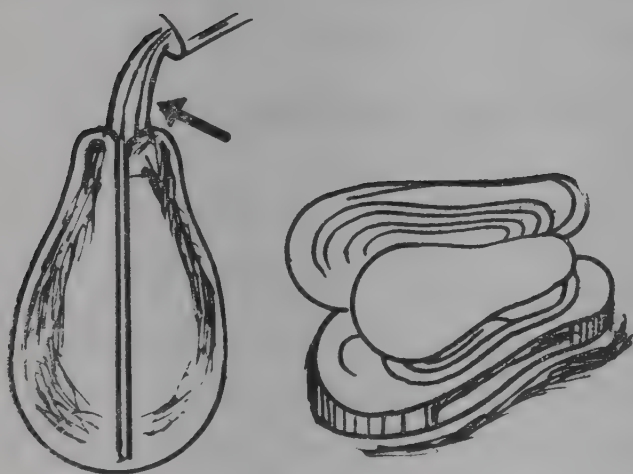
4 →



5→



SIMPLE MODEL MAKING



FINAL
MOULD
AND CASTING

2. Once the picture is ready, cut a strip of coarse grain sand paper to cover at least one-half of the material.
3. Paste the sandpaper with the rough side at the back of the picture. After this, the picture is ready to get easily attached to the flannel board.

Different topics can be developed and a series of pictures can be stored in large—sized brownpaper envelopes and can be stored in a cabinet.

SIMPLE MODEL — MAKING.

Young children learn “nature study” by direct experience that induce them to specialise in life sciences. At many stages, the students and teachers of life science feel the necessity of some models to make the study more interesting. For this, they should have some basic know-how of mould—making, casting and modelling. Here is a simple procedure given on which further ideas can be built.

1. Here is a fruit (illustration)
2. Half of this fruit is embedded in clay. The exposed area of the clay and the fruit has been brushed with thick soap water.
- 3 Now half a jar full of water is taken and plaster of paris powder is dropped into it till one inch of water is left. Then it is thoroughly

stirred till it gets the consistency of ordinary enamel paint. 4 Now a clay wall is built around the fruit base because when plaster is poured on to the fruit, the plaster may not run down.

Let the plaster set for 15 minutes and peel it off from the base which would be easy because of the layer of the solution of the soap. Now take the plaster half as the base along with the fruit with the solution of soap. Prepare fresh plaster as before and build the clay wall around the base. 5 Pour the plaster again and peel it off after 10 to 15 minutes. This will give the other half of the mould.

Now cut the pouring hole at any suitable point when the plaster is wet. With a kitchen knife scrap off the extra plaster and give a clean appearance to the mould. You can also give the title or the code number of the mould if you have to make a large collection of these. Many interesting natural forms like lizards, fishes, leaves, shells and stones can be cast. You can easily make a number of copies.

One has to remember that before every operation covering the mould with soap solution is a must. One has to learn a suitable procedure of making plaster mixture and pour it into the mould through the pouring hole, to make the two halves of the mould match before pouring the second half over the first, one should cut key marks as shown in the illustration.

One can easily develop several techniques on this basis.

DIORAMAS

Diorama is a three—dimensional presentation of certain objects mostly with its realistic background. As a learning activity, it has great potential. This activity can be profitably taken up as a science activity at the primary level. Given below is the specimen development of a diorama.

The children collect a nest.

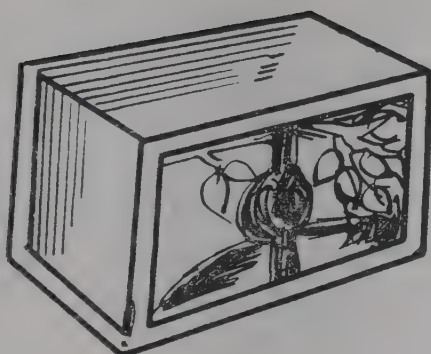
The teacher motivates them to study about the bird which occupied the nest.

The children go out with the teacher on a fieldtrip and see the exact location and observe the bird in its habitat, collect foliage, branch of the tree and sketch the landscape.

CONSTRUCTION

Get an old packing case 3'X2'. Take a cardboard $1\frac{3}{4}'$ X $3\frac{1}{2}'$. Paste white paper on it and paint the suitable background to the nest and then fit it in a curved form at the back of the box. Then take the branch of the tree and mount it with nails. After this the nest is hung and a hardboard frame is put in front. This is a very simple diorama.

One can build very complex dioramas also. By using artificial light an illusion of depth can be created.



SMALL
USELESS BOXES
CAN BE CONVERTED
INTO
DIORAMAS

AUDIO—VISUAL DOCUMENTATION IN VIKRAM A. SARABHAI COMMUNITY SCIENCE CENTRE PROGRAMMES.

Many of us who still have not tried the full range of audio-visual documentation with students, would like to get a model of such a procedure in science learning. The Vikram A. Sarabhai Community Science Centre has over the years been exploring the possibility of making science teaching effective by conducting different innovative experiments, trying out new text material, low-cost teaching aids and audio-visual techniques in teaching. One of these experiments entitled "Core Programme" (Science Learning Through inquiry) has been conducted by the Centre for over past eight years. This programme lays emphasis on the learning situation rather than the traditional active teacher and passive student format. This is of course a new concept in science learning/teaching and the audiovisual documentation and presentation go with it is a newer concept.

The basic ideas of the role of audio-visual documentation and presentation are discussed at length in the document setting out the objectives of the Vikram A. Sarabhai Community Science Centre. But obviously, the practical application of these concepts became more meaningful during the course of Inquiry Programme Sessions. Although audio-visual documentation and presentation by the students is fairly a

realistic approach, its logic will be easily acceptable to all those who are involved in the process of learning and teaching science.

Here is given a feature of a typical programme documentation activity. After the introductory sessions each individual joins one group. Each group has a certain scientific investigation; the next step is for them to sort out and present the data in a cogent manner to all the groups to elicit their comments.

One such group working on a problem, "Living and Non-living" had proceeded to experimentation. At a suitable point it started the collection of specimens. They had to keep a record of these and hence felt the need of some quick graphic techniques. According to the Centre's procedure, the audio-visual laboratory facilities for scientific documentation technique are available to all participants.

In the above group for graphic documentation the audio-visual laboratory guided the participants to try out the 'PHOTOGRAM or CAMERALESS PHOTOGRAPHY'. Each participant produced photograms of his own collection. Then they went on to the aspect of classification. Some of them documented their classification on photographic papers. As in all documentation activity, this activity has two aspects, one is the documentation and the other is the experimentation with materials and methods. The

participants were acquainted with dark-room techniques by actually working with photographic materials.

In the group investigating aspects of "Pressure" in the inquiry programme, the members observed a very complex phenomenon. It was indeed very difficult to explain verbally. The group realised the necessity of visual documentation for presentation. In the audio-visual documentation session their ideas became clearer, as documentation actually served as a re-statement procedure and helped in having permanent records even for subsequent use.

The "Soil Group" had a series of quantitative data and its presentation was being attempted by them for the first time. In the audio-visual laboratory the members found out the material and suitable methods for bar and pie-graph presentation.

The major attempt accordingly in any audio-visual or documentation activity should be to invoke in the child the spirit of "Creative Documentation".

WHAT DO THE YOUNG PARTICIPANTS SAY:

At the end of one of the inquiry sessions, young Mohan, one of the participants in the seed to seed project, came and told "you know what was tremendous about the whole thing? The documentation and presentation made all the ideas clear in my head. I could convince my friends about my work

and results by visual demonstration of my experiments”.

In another session in the Inquiry Programme, Leena, a girl created a small collection of slides, the procedure of which opened for her the world of microscopic objects. On asking her as to why she was so much engrossed in making the slides, she told that it makes her learn things better and to make permanent records of what she has learnt,

We have therefore four aspects of the audio-visual documentation and communication:

- (a) The experimenter produces audio-visual documentation while experimenting. He uses this documentation for presentation.
- (b) During the teaching programme maximum use is made of audio-visual material like films, slides, overhead transparencies etc.
- (c) Courses in audio-visual documentation and presentation are being run for teachers and students.
- (d) The use of audio-visual aids for communication with the community. This activity is done through presenting science film shows and exhibitions.

In the creative documentation, communication has a priority and the technique follows it. It is never a craft activity. Its significance lies in its relation to a communication.

Finally, the general viewpoint nurtured over long years in schools that audio-visual activity necessarily means film and slides is not correct but similar visuals and equipment like the magnetic board or the flannel board also convey the message as effectively with less resources. The work with different groups engaged in scientific investigation, documentation and presentation elicited the following inferences.

1. For documentation the participant must start with the simplest technique.
2. Each technique must be chosen to suit a particular communication need.
3. The participant must be taught ways and means to improvise communication devices. Before the participant starts any documentation or presentation of an activity he should understand some basic steps involved in the process of communication itself.
4. Easy to understand knowhow should be given for handling gadgets like magnetic board, flannel board, slide projector and epidiascope. A

session in handling of art materials will have useful influence on the participant.

5. Greater familiarity with handling of audio-visual materials facilitates better creation and use of communication material.
6. Modest planning and quick rehearsal helps presentation.

List of materials suitable for inquiry programme type of science projects:

Materials: Pencils, poster colours, enamel paint, magic markers, sand paper, soft board, perforated hardboard, coloured pencils, water colours, waterproof ink, felt pens, photo paste, plyboard, crayon, oil colours, fine pens, tracing paper, knife, blackboard, clay (modelling)

simple carpentry equipment, camera, slide projector, filmstrip projector, photographic film, ground glass slides, nails (various sizes) simple darkroom equipment, epidi-
ascope, photographic paper, reed pens etc.

Drawing instruments :

3 Small-size drawing boards, 3 sets of inexpensive setsquares, brown paper, coloured paper, cardboard, mountboard,

rubber cement, hardboard, 3 T/squares, drawing paper, coloured gelatins, coloured drawing paper, mount cutting knife, coloured tissue paper, scissors, pens.

PROCEDURE FOR BORROWING FILMS & FILMSTRIPS.

Teachers who want to use films as supplementary material to their teaching can create their own film and filmstrip borrowing system.

1. Write to different film—lending agencies and get their membership forms.
2. After becoming a member, get catalogues from them.
3. Pick out films in relation to your lessons or projects one month in advance.
4. Send your demand note to the film libraries three weeks in advance. (A sample form for the demand note is on the next page).
5. Choose alternate titles also because the film libraries have limited copies and demands are many.
6. Once you get the film, preview it, preferably with a group.
7. Also think about the questions which are likely to be asked by the viewers.

8. It is important that the films be sent back immediately after showing and by registered post-parcel. Go through post office regulations carefully before making parcels.
9. Every film library expects a show report. Fill out the show report and if you have any special observations, make them.
10. Keep your own record.

You can explore the possibility of an inter-school exchange programme of films and filmstrips that each has in its permanent collection.

CAMERA AN A. V. FRIEND OF STUDENTS. (From A Student's Sheet)

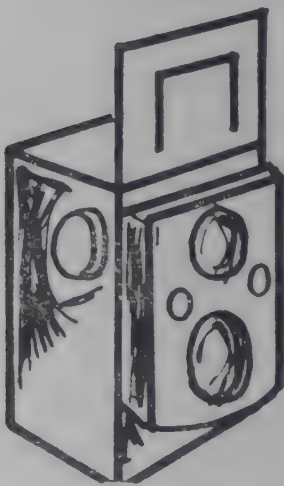
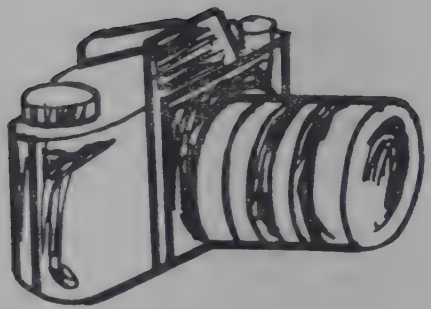
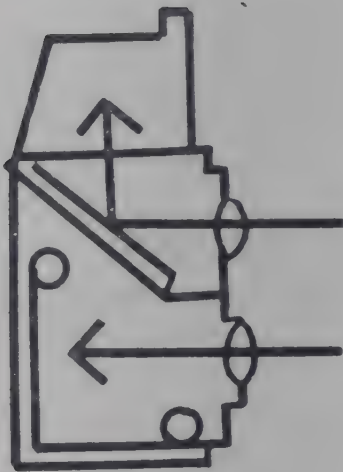
MOHAN uses a simple magnifying lens to get an inverted image on a wall.

He has also made a box with a pinhole in front and gets an image on a tracing paper at the back. He has a small camera. He carries it wherever he goes. After all, the camera is his friend !

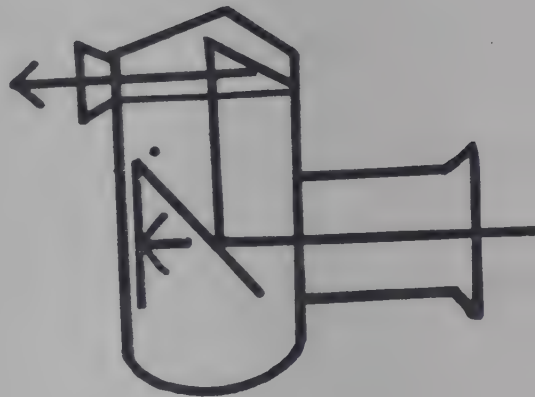
He knows very well the parts of the camera.

- A. Lens
- B. Shutter
- C. Light-tight box
- D. Viewer
- E. Film.

When Mohan goes to a photoshop, he puts many questions about cameras to the shop keeper. There he sees many types of cameras.



TWIN LENS
CAMERA



SINGLE LENS REFLEX
CAMERA

BOX CAMERAS

Have lens opening shutter and distance setting, fixed for ever. They give good results in satisfactory lighting condition.

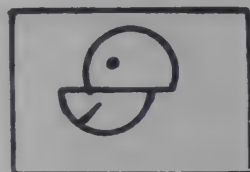
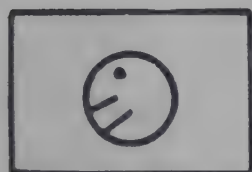
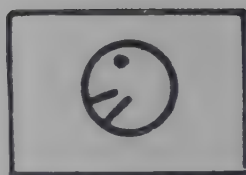
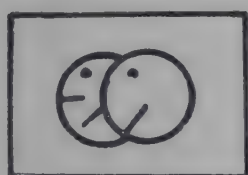
35 mm MINIATURE CAMERAS

They are compact and expensive. They take 35 mm film which is used in normal motion picture work. Cost of camera depends on the quality of its lens and other devices like viewing, light-measuring and film winding. In some of the 35 mm cameras, we can see the picture just as it falls on the film. They are named as single-lens reflex cameras.

TWIN LENS CAMERA

Quite a few photographers use a large format camera which takes 120 mm film. It is named as twin lens camera because upper lens shows the picture in the viewer while lower takes picture to the film. Whatever may be the type of camera, Mohan has found out some simple rules about its usage:

- * Decide the area of picture making
- * Always hold the camera steady
- * Light should fall on the object over the shoulders of the photographer and not to shine towards the camera.



FOCUSING
DEVICES
DIFFER IN DIFFERENT CAMERAS

- * Taking photograph of the objects from nearer distance so as to give interesting results.

Mohan proved his ability to use his simple camera and therefore his uncle allowed him to use expensive one.

FOCUS/DIAPHRAGM/SHUTTER SPEED.

Mohan found it totally different from his small box camera. In this camera, there was a focusing device and a shutter speed device. Trying out a few things and also by asking innumerable questions. Mohan knew a few simple things about focus, diaphragm and shutter,

A box camera has a set lens and everything is in a workable focus (but certainly not excellent). You can not go nearer without supplementary lens. In expensive cameras, there are two types of focus setting devices viz. (a) super-imposing and (b) splitfield.

SUPER IMPOSING

It will show two images unless the focusing is correct.

SPLIT FIELD

Range-finder will show two half images, one below an other if the focusing is correct.

Mohan acquired very good knowledge about lens opening. The lens opening is controlled by a diaphragm. Lens opening numbers are known as f/number. So, we describe diaphragm opening as F. 4.5, F. 5.6, F.8, F. 11, F. 16.

FULL LIGHT INTENSITY. LOW LIGHT INTENSITY

(F. 4.5)

(F.16)

Shutter speeds are rated in terms of fraction a second. Therefore we know the speeds as 1/100, 1/50, 1/25, - /1/10, 1/5, 1/2 and 1. Longer exposures can be given by putting lever on B.

USEFUL INFORMATION ABOUT SHUTTER-SPEED CHECKS:

Description	Speed
Subject not moving	1/30 sec.
Slow walking	1/60 to 1/100
Running objects	1/200 to 1/250
	Speed
	1/250 to
Sports	1/500 sec.

MOHAN CERTAINLY KNEW THAT EXPERIENCE WILL GIVE HIM THE FINAL KNOWHOW.

AUDIO VISUAL COMMUNICATION FOR A RURAL AREA.

Communication is a very abstract concept. It would mostly be a question of finding out suitable

media. The major concern would be to bring balance between the budget and then use of different channels of communication. It is vital at this stage for a country like India to communicate with rural areas by means of sophisticated technology. But at the same time, the communicator will have to utilise all the media possibilities existing there. Therefore his major focus should be on choosing as many media as possible. The following media may be found suitable for a small rural district. These observations are based on the author's experiences gained in Kaira District, Gujarat State. As it happens in a vast country like India, the rural pockets have a different economic, social and educational set-up and therefore a standard prescription or a sweeping statement about the facts would not be applicable to a larger part of the rural areas in our country.

HOW DOES A VILLAGE GET THE INFORMATION ?

A villager in relation to another villager is a great communicator. One of the reasons is that one villager takes a message to another villager and makes up the communication gap that exists because of the nonavailability of mechanical mass media. If we take this point of view then, the following would appear to be the vital communication points.

- (a) *School*: Children from all parts of the village gather at this spot and with the village news

they come back to their homes. Therefore, the school is a point of information concentration. The teachers are the people on whom the villagers depend for many interpretations of intellectual informations.

- (b) *Panchayat Office*: The philosophy of authority comes here and therefore the information oriented at this point is related with official administration and the information becomes acceptable. The message conveyed by a Sarpanch, Talati or Gram Sevak will be considered to be worth attending to by a villager. This does not mean that they are virtually motivated to act upon the information.
- (c) *Place of prayer*: Information through the place of prayer or temples will be a very suitable channel. Normally almost all rural areas will have temples or mosques where villagers go and sit when they are free. It is at the time of leisure that they are bound to think of new ideas and new informations.
- (d) *Bus stop or railway station*: A small tea shop becomes a possible meeting place for village folk and therefore it is as good as a information distribution point. The shopkeeper therefore works as an agent at this place for developing a smoother communication channel.

- (e) *Village Well* is disappearing fast as many small water pumping stations have come into existence. Yet the vital spots around the water taps serve as good locations for discussing information.
- (f) *Entertainment spots*: Mostly, the open chowk either in the centre of the village or at the end of the village serves for entertaining the village crowd with the local dramas, folk plays, film shows and slide shows. Any thing irrespective of quality or content happening at these places serves as a good point of attracting crowds. Although these days there is a fairly good control by Gram Panchayat on such entertainment.

While developing media strategy, it is very necessary to be conversant with the rural areas. How to utilise the information points of a village in developing media? What are the factors that determine the pattern of media ?

The media pattern is decided by intellectual, financial and technical resources.

- i. *The intellectual resources* would help in locating the basic communication problems and making clear cut statements about them. Making a clear cut statement is an essential part of the whole strategy. Otherwise the budget determinant

would be very fluid and it will be extremely difficult for the media team to put limited resources on one focal point.

For a small budget provision, it is wiser to use media in a limited area. This will be easy to manage and the planners will be able to finalise the strategy very well. A rough feeling of communication influence will be also easy to achieve in a small area in comparison to diffusion of resources in larger areas.

A broad survey of the area can be done before the actual communication media is planned and released. The major points of survey are as under:

Name of the village—————

Dist:————— Taluka:—————

Locality: Nearness to towns—————

Relationship with towns—————

Existing facilities (means of transport/
communication channels/near-
ness to health centre, market,
nearness to highways, maternity
homes/schools, panshop, tea
shop, flour mill, public wells,
bus stops, touring cinema,
telephone, radio, handicrafts
newspaper, temples)

Population———— Religions—————

Languages—————

Income levels of different social groups—————

Social differences—————

Existing organisations/institutions (religious/political)

Temperament of the people towards change—————

Some more details could also be added by the planners as per their need. The information after simple analysis would help the media planners in getting an overall picture of the communication potential of the area.

In a communication process, barriers always exist. They remain most of the time unknown even to the specialists. Still it is logical to spot the barriers on the following lines:

1. *Language barrier:* Most of the time the rural audience do not accept too much of urban slang and they think that it lacks vitality and it is comic too. But this can be taken care of by using a simple language. Language barrier has been broken by constant radio programmes utilised in the rural areas. Again increased amount of literacy and use of textbook by children with standardised language has paved a path for acceptance of grammatical language. It is not wise to use rural slang and accents in a highbrow way. A highbrow conversation produces laughter at one end and lacks precise feeling. Slang can only be used by the authors who might have lived in a village/villages for a pretty long time. In

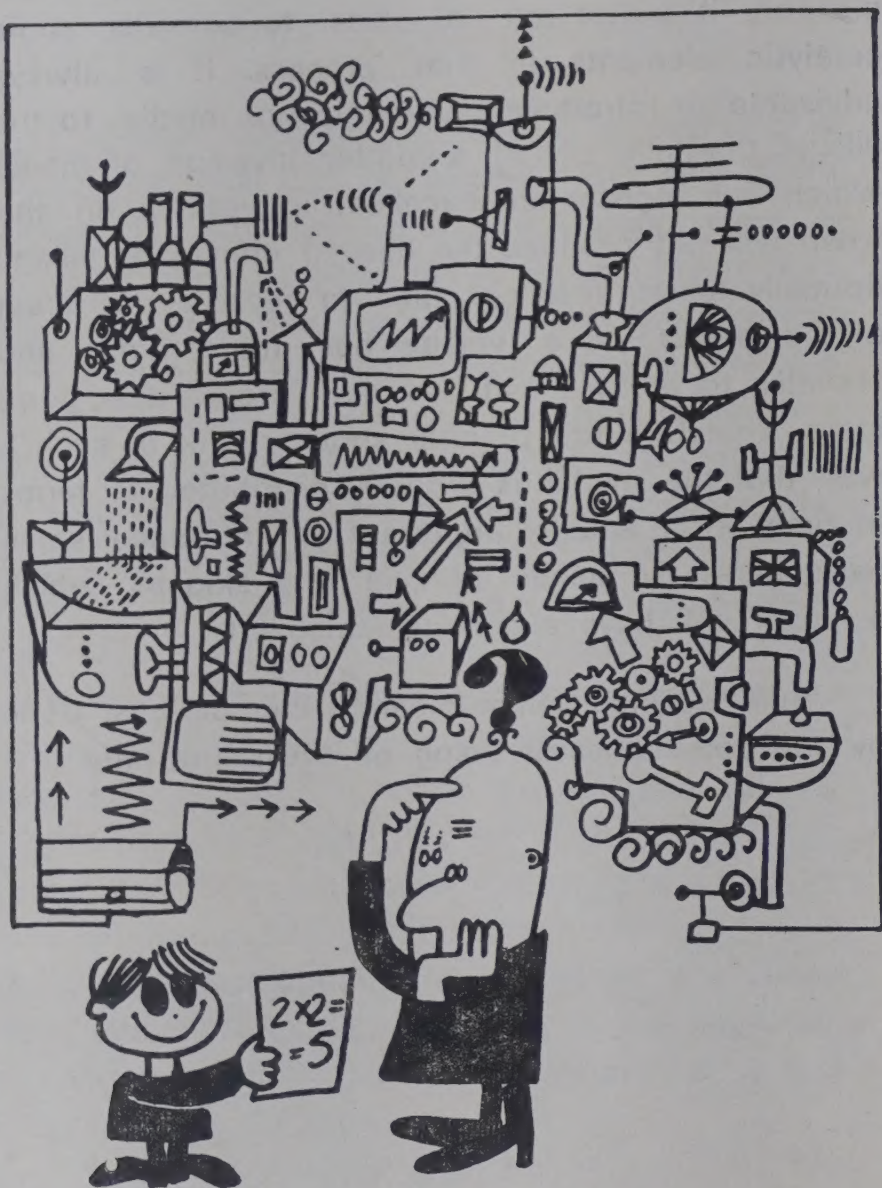
terms of visual material, it is necessary to produce symbols with which the villagers are familiar.

2. *Cultural barriers:* The urban culture is very different from rural culture. Although the rural youth adopt urban clothing, read newspapers, work in modern factories, listen to the radio, go to motion pictures, yet there is a big shell of rural culture under which most of the rural population lives. For example with the best film material on smallpox, it is very hard to convince a village youth who is educated not to go to the Sitalama temple, the Goddess who is supposed to cure children from smallpox. It is a simple fact that by change in the location, a certain ethnic group will not leave their own method of looking at life. This happens much more in conveying scientific ideas which are at variance with popular beliefs and traditions in which the villagers believe. It is not necessary that this thing happens with villagers only. It happens with urban masses too. For example groundnut oil would be very much comparable with ghee in nutritional value. Most of the Urban Indians still think that ghee has a much greater nutritional value in comparison to oil. This may be a fact which needs examination.

Though only two major barriers are set out above, one should list out all possible barriers in communication before planning out the communication web.

As we talk about the barriers in rural communication, it is not out of place to consider some catalytic elements in that process. It is always advisable to introduce communication media to the village gradually. All of a sudden invasion of media which will register an excellent impression on the town will not produce the desired effect. The village normally takes a longer time to receive the effect of the impact as a villager has lot of time and facilities to discuss with his own groups new, good ideas. Therefore the planner should work in such a way that the media is properly distributed in terms of time. It is equally important to introduce some basic ideas by means of one line slogans which by itself will have a definite statement.

Rural science communication can be best done by the communicator being on the scene only.

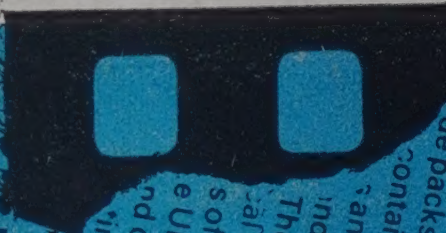


CAN'T YOU
EXPLAIN ME THIS
AN A. V. WAY ?



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COMMUNITY SCIENCE CENTRE
NAVRANGPURA, AHMEDABAD 380**

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